

Reply to Office Action dated July 29, 2004

Application Serial No. 10/038,264

November 29, 2004

**Remarks/Arguments**

The present amendment is made in response to the Office Action dated July 29, 2004, and identified as Paper No. 20040719. Claims 17-23 are pending in the application

In the Action, the Examiner rejected objected to claim 10 for lacking the term “portion.”

The specification was objected to as introducing new matter. Claims 10, 15 and 16 were rejected under 35 U.S.C. § 112, ¶ 1 for failing to comply with the written description requirement.

Claims 9, 10 and 16 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 4,605,153 to Van Den Brekel et al. (“*Van Den Brekel*”). Claim 15 was rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 4,532,681 to Baker et al. (“*Baker*”).

With regard to the new matter rejection, Applicant has amended specification accordingly. However, Applicant points out that the use of the term “region” to describe the metallic interface of the solder and pad does not constitute new matter. Applicant has merely chosen another term to identify structure which was fully described in the specification as filed. See MPEP 2163.07 (“The mere inclusion of dictionary or art recognized definitions known at the time of filing an application would not be considered new matter”). Indeed, “region” is an accepted synonym for “layer,” and Applicant has not defined the terms to mean anything other than their ordinary meaning in the art. See, e.g., [www.dictionary.com](http://www.dictionary.com). Regardless, the specification explains that the interface of the solder and metal pad is susceptible to flaws for many reasons, including the formation of intermetallics at the boundary layer, i.e., contamination of the solder by metals which ingress from the metallic pad. Whether the interface of the solder and pad is referred to as a “layer” or a “region” is merely semantics. More importantly, the cause of cracking is known to those of skill in the art and was specifically disclosed and described by Applicant.

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Applicant has cancelled claims 9-10 and 15-16 in favor of new claims 17-23.

Independent claim 17 recites:

A solder joint for interconnecting an electronic chip to a substrate, comprising:

a metallic pad having a substantially planar lower surface for engaging said substrate and an upper surface extending in a first plane;

an obstacle formed on said upper surface and extending at least partially in a second plane vertically spaced from said first plane; and

solder coating at least a portion of both said upper surface and said obstacle, whereby micro-cracks forming in said solder adjacent to said upper surface will encounter said obstacle.

Applicant has removed the purely functional matter from the claims and has more clearly defined the structure and explained the context of the present invention.

With regard to the anticipation rejection in view of *Van Den Brekel*, the reference does not disclose each and every limitation of the claimed invention as required for a rejection under 35 U.S.C. § 102(b). In particular, the reference discloses the use of two humped solder paste pads on a circuit board to aid in positioning a cylindrical electronic device. The cylindrical device is nestled between the solder paste bumps and the solder is reflowed to attach the device to the circuit board, resulting in the deformation of the humps. *Van Den Brekel*, col. 2, ln. 7 – col. 2, ln. 13. *Van Den Brekel* discloses that the two-humped solder paste bump is reflowed when connected to the cylindrical device. In other words, when the solder is attached to the device of *Van Den Brekel* it is altered in a manner that changes the structure shown in Fig. 2, which is pre-attachment to the device.

By contrast, the present invention comprises and claims a metallic pad having an *obstacle formed on an upper surface of the pad* to engage and retain a solder bump, not a two-humped *solder paste* bump. *Van Den Brekel* thus discloses the opposite structural arrangement of the

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claimed invention as the allegedly corresponding “obstacles” are initially present in the *solder* rather than the metallic *pad*. Regardless, the obstacle of the present invention on the upper surface is not altered when the solder is attached to the pad. Indeed, if the obstacles of the present invention were altered when the solder was reflowed, the invention would not resist the propagation of micro-cracks because the obstacles would no longer exist after the solder was attached and the joint would still fall prey to micro-cracks. In addition to having the obstacles in the solder rather than the metallic pad, *Van Den Brekel* also lacks the express claim limitation calling for the presence of obstacles on the upper surface of the pad when solder is coated thereover, because the solder pad of *Van Den Brekel* is reflowed during attachment in a manner which alters its shape to remove the obstacles identified by the Examiner.

With regard to the anticipation rejection in view of *Baker*, the reference discloses two seat belt buckle halves joined by a layer of solder which will release the seat belt when the temperatures rises above a predetermined temperature, such as in an automobile fire. Neither half of the seat belt buckle comprises a “pad” as that term is plainly used in the present application. The present invention is directed toward electronic chip manufacturing techniques, namely the formation of solder interconnects. By definition, a “solder interconnect” is the electronic term of art used to describe the micro-structure which electronically and mechanically joins an electronic chip to a printed circuit board or other substrate via metal “pads.” This is clearly the type of pad disclosed and claimed in the present application. Merely calling the belt buckle in *Baker* a “pad” does not bring it within the meaning of a “pad” as that term is used in the present application. More importantly, there is no teaching in *Baker* that the belt buckle halves can serve as a solder interconnect in electronic chip manufacturing. As a result, *Baker*

fails to disclose at least one element recited in the claims of the present application, namely the claimed “metallic pad” and thus does anticipate the invention under 35 U.S.C. § 102(b).

New claims 17-23 more clearly recite the field of art of the present invention and thus distinguish between the “pads” of *Baker* and those of the present invention. In particular, the claims now recite that the pads and solder are used to interconnect a chip to a substrate. Such explanatory language that is inherent in the disclosed invention does not constitute new matter, and anyone of skill in the art would instantly appreciate these aspects of the invention. MPEP § 2167.03(a) (By disclosing in a patent application a device that inherently performs a function or has a property, operates according to a theory or has an advantage, a patent application necessarily discloses that function, theory or advantage, even though it says nothing explicit concerning it); *see also In re Reynolds*, 443 F.2d 384, 170 U.S.P.Q. 94 (CCPA 1971); *In re Smythe*, 480 F. 2d 1376, 178 U.S.P.Q. 279 (CCPA 1973). Here, the claims merely recite the function and properties of “solder interconnects” as that term of art is understood by those of ordinary skill.

In any event, the specification provides support for the explanatory language used in claims 17-23. For example, on page 3, it is stated that the present invention may be used in connection with ball grid arrays, column grid arrays, and surface mount technology (SMT) joints. These structures are well known in the art for interconnecting electronic chips to substrates, such as printer circuit boards and semiconductor packages

The applicability of the present invention to electronic chip technology is also evident from the various related art patents that are disclosed and discussed in the specification. These patents also evidence that it is well known in the art that “solder interconnects” is the term of art used to describe the solder structures which mechanically and electrically interconnect electronic

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devices, such as chips, with substrates, such a printed circuit boards and packages. Similarly, the term "pad" is a term of art used to describe the metallic structure on a device or chip which provides a platform for the adherence of a solder bump. Thus, Applicant has merely recited inherent characteristics of the structures referred to by the terms of art in the applicable field of the invention.

Dependent claims 18-23 are directed toward the embodiments of the present invention previously recited the claims which were withdrawn in light of a restriction requirement. Applicant submits that new claim 17 is both allowable and generic to the various structures formed with the upper surface of the pad, as depicted in Figures 3a, and 3c-3g. Claim 17 does not recite structure as shown in the embodiment depicted in Figure 3b, in light of the issuance of U.S. Patent No. 6,347,901 for a separate serpentine structure that is bonded to the upper surface of the pad.

A Petition for a One-Month Extension of time and authorization to charge the fees for same are enclosed.

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In view of the foregoing amendments, the Examiner's reconsideration and allowance of the present application is believed to be in order. If the Examiner believes a phone conference with Applicant's attorney would expedite prosecution of this application, please contact the undersigned at (315) 218-8515.

Respectfully submitted,

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